

REMARKS

Claims 1, 2, 21 and 22 are pending in the Subject Application. Claims 3-20 were withdrawn in response to the election made by telephone on July 26, 2005. Applicants hereby confirm the election to prosecute claims 1, 2, 21 and 22.

Claims 1 and 2 have been amended and new claims 23 and 24 have been added. Basis for the added claims is in original claim 1 and in the specification at pages 5 and 6. No new matter is introduced by the amendments or the new claims.

As a preliminary matter, please note that the Attorney Docket number for the Subject Application has changed from prior counsel's number noted on the Action to the undersigned counsel's number, 040650, noted on this paper.

Rejections: Claim 1

The Examiner rejected claim 1 under 35 U.S.C. §102 (a) as being anticipated by either of Hasegawa, U.S. Patent No. 5,766,376 or Ishii, U.S. Patent No. 6,494,970. The Examiner referred particularly to examples P3, P4, P7 and P8 in Table 1 and alloy examples P28 and P29 in Table 5 of the Ishii patent and to example 19 in Table 1 of the Hasegawa patent.

The Hasegawa patent describes an alloy that requires the addition of Ti, Zr and Nb. At column 5, beginning at line 38, Hasegawa states that the addition of Ti and Zr "constitute the very gist of the invention." The alloy steel described by the Hasegawa patent also includes 0.01 to 0.5% Nb. At column 5, beginning at line 21, Hasegawa states that Nb improves the high temperature strength as it precipitates in the form of MX type carbides or carbonitrides. Hasegawa goes on to say that at amounts less than 0.01%, the effect can not be recognized, and thereby teaches away from a steel composition lacking in Nb. Nb, Ti and Zr are among the "fundamental" components of the Hasegawa alloy. See column 5, lines 62-63. None of these elements are included in the claimed steel alloy of the Subject Application and there is no suggestion that they should be excluded. To the contrary, all three are fundamental to the Hasegawa steel composition.

Niobium forms particles with carbon (NbC), which will be present when the steel is heated (austenitized) for quenching. These particles will tie up carbon, and will lower the strength. Carbon is needed in solution in the claimed steel alloy of the Subject Application, not in the form of a particle, so that the full strength and hardness is achieved by quenching. The absence of Niobium is important to the function of the claimed alloy.

The Ishii patent describes an alloy steel that includes Boron in various amounts from 0.001 to 0.004 mass %. A Boron equivalent is described as $B + 0.5N$. See column 2, lines 8, 45 and 62 and Table 1. The alloy of claim 1 does not include Boron.

As stated above, the alloy steel of claim 1 does not include Ti, Zr, Nb or B. It does include Ca at about 0.50% maximum Ca and Sulfur at about 0.012% maximum sulfur. Neither the Hasegawa patent nor the Ishii patent disclose Calcium as a possible component of their alloys. The Subject Application states at page 5, paragraph 0016, that Calcium is included as a Sulfur control agent. Hasegawa recites Sulfur at less than or equal to 0.010 mass % and Ishii recites Sulfur in Tables 1 and 5 at 0.001 and 0.002 mass%, but neither include the Calcium that applicants state is needed as a Sulfur control agent.

Claim 1 has been amended to recite an alloy steel consisting of the recited elements in the weight percents set forth therein. The claim thus excludes any other elements apart from impurities. MPEP §2111.03. Applicants submit that claim 1, as amended, defines a novel and nonobvious invention that is neither disclosed nor suggested by the Hasegawa or Ishii patents. Withdrawal of the rejection of claim 1 under 35 U.S.C. §102 (a) and allowance of claim 1 are requested.

Rejections: Claim 2

The Examiner rejected claim 2 under 35 U.S.C. §103(a) as being unpatentable over the Hasegawa patent in view of Table 1.1 of Introduction to Steels and Cast Irons. The Examiner stated that the differences in Si content between the Hasegawa patent and claim 2 were a mere difference in the proportion of the element without any attendant unexpected results which would distinguish the claim over the prior art. The Examiner also stated that even though the

prior art does not teach 0.011% Al, 0.1%Cu and 0.02% Ca as recited by claim 2, such would not be a patentable difference because those elements are well known additives for enhancing, for example, strength and hardness.

The alloy steel of claim 2 recites Si at about 1.00%. Hasegawa teaches Si in the range of 0.02% to 0.80% and Ishii teaches Si in the range of 0.10 to 0.30%. The comparatively high Si content of amended claim 2 is an essential part of the claimed steel design. Because of its unusual heat treatment (a low tempering temperature of 400-500 °F), the claimed steel utilizes an elevated Si content to prevent a phenomenon known as "tempered martensite embrittlement" which can occur at these tempering temperatures. The claimed steel alloy is designed for high strength, high impact uses, such as bomb casings. At page 2, lines 1-4 and page 3, paragraph 0007 of the Subject Application, applicants describe the steel for use in military applications, such as ordnance components and hard target penetrator war heads. The claimed steel alloy is particularly useful for penetrator bombs intended for deep penetration beneath the earth and the sublevels of buildings. Steel that can become brittle would be useless. Thus, the difference in the higher Si content is an important feature of applicants' alloy steel.

As stated above with respect to claim 1, the Hasegawa patent does not describe the use of Calcium in the steel composition. While Calcium may be a well known additive in other application of steel, there is nothing in the Hasegawa patent that suggests including it and eliminating other fundamental elements. The specific combination of elements recited in claim 2 in the amounts claimed are not disclosed or suggested by the Hasegawa patent, alone or in combination with the Introduction to Steels and Cast Irons reference.

In addition, as stated above with respect to claim 1, the Hasegawa patent requires the inclusion of Ti, Zr and Nb, none of which are included in the alloy steel of claim 2. Claim 2 has also been amended to state that it consists of the recited elements.

Both the Hasegawa and Ishii patents describe very different steels than the claimed steel alloy. Although they contain similar ranges for some alloying elements, these other steels are low strength ferritic alloys designed for high temperature creep resistance, as the experimental evidence included in those patents demonstrates. These steels have completely different

microstructures and properties than the steel alloy recited in claims 1 and 2 of the Subject Application. Although the temperatures used in making the claimed alloy steel and the intended use of the claimed alloy steel are not part of claims 1 and 2, the manner in which the steel is made and the intended use do dictate which elements should be included and which should not be and in what amounts. The chemistry, heat treatment, properties and application of the claimed steel all make it distinct from the steels taught by the Hasegawa patent. Thus, the combination of elements and the amounts of those elements recited in claims 1 and 2 define a novel and nonobvious combination that is not disclosed or suggested by the combined cited references.

Withdrawal of the rejection of claim 2 under 35 U.S.C. §103(a) and allowance of claim 2 are requested.

Rejections: Claims 21 and 22

The Examiner rejected claim 21 under 35 U.S.C. §102 (a) as being anticipated by, or in the alternative, under 35 U.S.C. 103(a) as being obvious over the Ishii patent alone or in view of Lyon, U.S. Patent No. 2,942,339.

The Examiner also rejected claims 21 and 22 under 35 U.S.C. §103(a) as being unpatentable over the Hasegawa patent alone or in view of the Lyon patent.

The Examiner stated that making a steam turbine casing or a pipe for use in thermal power plants, as disclosed in the Ishii and Hasegawa patents, respectively, would be equivalent to making a bomb casing. The Examiner also stated that it would be obvious to use low carbon steels, which are known to have high strength and ductility and their use in bomb casings as shown by Lyon, with the low carbon alloy shown by the Ishii. Applicants respectfully disagree.

As stated above, the Hasegawa and Ishii patents describe alloys that are very different in critical respects from the claimed alloy steel of the Subject Application. Neither patent teaches an alloy steel that would be useful for a bomb casing. Neither patent teaches an alloy steel having the combination of elements in the weight percents recited in claims 1 or 2. While the

Lyon patent makes an incidental reference to low carbon steels for use as bomb casings, the types of bombs made today were not known in 1955 when the Lyon application was filed. The fact that a low carbon steel was useful for a bomb casing at that time does not begin to disclose or remotely suggest the combination of elements in claims 1 or 2 that provide the material for the bomb casing of claims 21 and 22, respectively.

Applicants submit that the subject matter of claims 21 and 22, which incorporate the alloy steel of claims 1 and 2, respectively, is neither disclosed nor suggested by the cited references, taken alone or in combination with the Lyon patent. Claims 21 and 22 recite a novel and nonobvious bomb casing material. The material provides a significant improvement in the materials heretofore available for bomb casings, especially high impact penetrator bombs. Withdrawal of the rejections under 35 U.S.C. §§102(a) and 103(a), and reconsideration and allowance of claims 21 and 22 are requested.

New Claims 23 and 24

New claim 23 is similar to original claim 1, but the Si content is about 1.25wt%, much higher than the Si content of the cited references. New claims 24 is similar to original claim 1 and new claim 23, but recites certain elements as “an amount of” the element “up to” a maximum wt%. As discussed above, the cited references do not disclose an alloy steel with the recited elements in the wt% ranges recited in new claims 23 and 24 and do not disclose Si at levels above 0.8mass%.

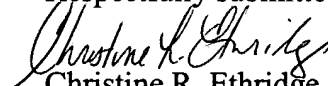
Consideration and allowance of new claims 23 and 24 are requested.

Conclusion

Applicants have made every effort to advance prosecution of the Subject Application. Claims 1 and 2 have been amended and new claims 23 and 24 have been added. The claims are believed to be in condition for allowance. Reconsideration and allowance of claims 1, 2, 21 and 22 and consideration and allowance of new claims 23 and 24 are respectfully requested.

If the undersigned can be of any assistance to the Examiner in advancing the application to allowance, the Examiner is urged to contact the undersigned attorney at the number set forth below.

Respectfully submitted,


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